

lished with those observed by others, in such a way that the results will form a portion of the whole structure of science. In other words, the investigator must be able to generalize or do hack work. Without generalization there would be no sciences, and the present comity existing between kindred disciplines would be absent. Observations, however carefully carried out, are not research, and it is wrong to call the mere observer a research worker.

The logical result of the above argument is that the student, in order to accomplish anything as an original worker, must clearly realize the necessity, not only of a thorough understanding of his own subject and of the allied branches, but also the importance of a good substratum of general culture. The more a man has used his brain as an apparatus for thinking, the more he will be able to do in research. For this reason the undergraduate should not be too anxious to specialize. Let him, perhaps during his four years' course, obtain some insight into the underlying facts and theories of his chosen science, but, of all things, let him beware of neglecting the opportunity of familiarizing himself with the world which surrounds both him and the subject to which he intends to devote himself.

The undergraduate who really means to accomplish something, makes no greater mistake than to suppose himself able to do without graduate work. All beginners are dependent on their teachers, the advanced student should learn to depend upon himself, and this end can only be reached after the necessary preliminary routine is completed.

An undergraduate can not be expected to master the necessary details of a profession. He must and will be an amateur. If he really loves the subject he has chosen he certainly should be willing and anxious to prepare himself for further development by graduate study. Here, too, the brief time given to obtaining the master's degree is not sufficient for any valuable results in research; nor, indeed, if the student has properly used his time during the preliminary period of training, will he be prepared to properly launch himself in the higher fields of original investigation. He had far better devote the interval given to the intermediate degree to acquainting himself with the necessary details of his chosen subject, with its relations to other sciences and to gaining as good an insight as possible into its literature and history. In this way the worker will discover in what portion of the field an original investigation can be carried on, understand its relative importance, and comprehend the way in which it is related to the whole structure of which it is to form a part. A man so trained may do something worthy of the doctorate and also worthy of the vast field of scientific thought into which he has entered.

Above all, no one should strive to begin scientific work actuated solely by mercenary considerations. The question is too often asked: Where can I apply this to some practical end? How can I make money out of this subject? No more blighting influence to scientific development can be imagined. It deprives science of the very essence of its existence—the universal comity of knowledge—it changes that which might be for the good of all into something for the benefit of the individual pocketbook; it retards rather than accelerates growth. The history of each individual case is but a repetition of the universal history of science. A premature attempt to apply what he has acquired to practical ends simply results in robbing the student of his power for further development. It leaves him where he stands for all time to come, and his more studious brethren will soon pass and distance him, regardless of the fact that his immediate pecuniary gain may be greater.

The sciences of to-day form a body of great generalizations, none of which have come to us through the efforts of one man; they are, on the contrary, a result of gradual growth in each step of which the mental acumen of some investigator, perhaps long since dead, can be seen, and each research of to-day is built upon some perhaps equally great one of yesterday. Science is a stern mistress who gives of the best within her only to those who follow her unflinchingly, however difficult the task, however remote the prospect of pecuniary gain or of self-aggrandizement, their sole hope being that they, too, may add to mankind's knowledge of truth, so that future generations may profit by the sacrifices of the present. This has been the spirit of the past; it must also be the spirit of the present and of the future. Science is moving onward, swiftly, relentlessly, unflinchingly; no half-hearted followers for her; the weak fall by the wayside; there is no place for those who have not the patience to acquire the necessary knowledge. The strong press forward in fierce rivalry, each striving for the ultimate goal, a perfect human knowledge by which from any given premises the logical conclusion may be drawn with unerring accuracy.

CLIMATE AND FLORA.

Mr. Thomas H. Kearney, Jr., has published in *Science* a series of articles on the plant geography of North America. In that journal for November 30, Vol. XII, pp. 840-842, he gives expression to some of the "conditions of climate and soil which permit the actual existence of numerous lower austral forms in juxtaposition to a transition and even Cana-

dian flora." He believes the factors that have the largest effect in determining the zonal distribution of organisms are (1) the normal number of days during the year which possess a temperature of the air above 6° C., or 43° F.; (2) the normal sum total of temperatures above 6° C.; (3) the normal mean of the six consecutive hottest weeks. The following table gives the values of this data for four stations in the mountain region and two of the most northern stations in the Austro-riparian area. The two additional factors of importance, permitting species to maintain themselves in what would seem to be an unfriendly environment, are (4) the amount of insolation as to duration and intensity; (5) the nature of the soil. As the items 1-4 are already computed for many Weather Bureau stations, it would seem possible to make an extended inquiry along the lines suggested by Mr. Kearney.

Stations.	Altitudes.	Days with temperature above 43° F.	Sum total above 43° F.	Normal mean of six hottest weeks.
	<i>Feet.</i>	<i>Days.</i>	<i>° F.</i>	<i>° F.</i>
Highlands, N. C.	3,817	234	3,547	66.1
Asheville, N. C.	1,981-2,250	249	4,688	71.3
Knoxville, Tenn.	891-933	267	5,563	76.1
Vallehead, Ala.	1,027	293	5,488	75.2
Norfolk, Va.	11-12	295	6,047	79.3
Memphis, Tenn.	117-273	307	6,754	81.0

HEAVIEST RAINFALL AT LA CROSSE, WIS.

Mr. R. H. Dean, Observer, Weather Bureau, at La Crosse, Wis., reports that the rainfall on the 27th and 28th exceeded all previous records for twenty-four hours at that station. He has compiled the following table, showing the amount and date of the greatest daily rainfalls in each month since 1871, inclusive. The record of 7.23 inches on October 27-28, 1900, occurred in twenty-two hours and eighteen minutes, between 10:12 a. m. of the 27th and 8:30 a. m. of the 28th:

	Inches.
January 28 and 29, 1891	1.32
February 27, 1876	1.10
March 27, 1880	2.05
April 27 and 28, 1889	1.66
May 14 and 15, 1900	1.90
June 11 and 12, 1899	4.91
July 14, 1900	4.12
August 7 and 8, 1889	4.25
September 6 and 7, 1884	5.69
October 29 and 30, 1896	2.41
October 27 and 28, 1900	7.23
November 10, 1880	1.74
December 24 and 25, 1895	2.11

METEOROLOGICAL CABLEGRAMS.

On page 248 of the *MONTHLY WEATHER REVIEW* for June, 1900, we have given in full the title of the Atlantic Cable Directory for the convenience of those who have occasion to transmit to the Weather Bureau meteorological information from foreign countries by cable or telegraph. As this work is no better known than several other systems of cable cipher, we append also the following titles of other works, and would say that any dispatch for the Weather Bureau may be sent in any system of cipher that is most convenient to the author, provided it has been published, with confidence that the Weather Bureau will be able to decipher it as all ordinary cable codes are at hand or available for this use. Among the codes most used in America and Europe are the following:

No. 1, The Atlantic Cable Directory, already referred to.

No. 2, Western Union Telegraphic Code and International Cable Directory, compiled and published by the International